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ILLINOIS ENGINEER



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THE ILLINOIS ENGINEER, MAY, 1956—VOLUME XXXII, NO. 5

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PRESIDENT'S MESSAGE

WHAT AM I DOING HERE?

Thoughts and ideas running through my mind after the annual meeting and the first meeting of the 72nd Board of Direction remind me of the naked character,

the unclothed little man, who found himself on a hot, sunny day in the midst of a desert desperately pumping a railroad hand-car along a lonely stretch of track. Suddenly realizing the seriousness of his predicament, he asked himself, "What am I doing here?" Now that the enthusiastic atmosphere of the 71st Annual Meeting is a memory, I am interested in the similarity of our predicaments.

President Johnson

Obviously, your new president has been propelled in the vehicle of his office along the track constructed and traveled by his able predecessors. And now that the committees have been appointed, budget quite well threshed over, and committee duty assignments made, your president finds himself wondering not only "What am I doing here?" but where "here."

The track which was projected at the April 14 Board of Direction meeting heads towards legislative actions to improve laws relating to registration of professional engineers and enforceability of such laws. It also is directed toward a more up-to-date schedule of fees and salaries, a systematic study of functional facts in our professional society, a study of the desirability of more vice presidents, more attention to young engineer members, and more of several other activities including membership acquisition.

It would be immaterial where your president is on the projected track and how far he goes on it, were it not for the fact that the progress and welfare of ISPE is almost entirely dependent on the constructive work of the committees constructing the track. When you as a member of ISPE, either in the capacity of committee member, chairman or officer, or just John Q. Member, are asked to work on an assignment, please remember therefore that the progress of our Society of Professional Engineers will be accelerated in proportion to the effort you put into the task at hand. When you find your state officers asking for assistance or greater effort it will be because we are trying to make more progress for ISPE and its members wherever we may be along the 72nd stretch.

ROYCE JOHNSON, President

Vox Secretarii

By P. E. ROBERTS, *Executive Secretary*

71st Annual Meeting Notes

The 71st Annual Meeting lived up to all of its promises. Chairman Sidney Danoff and Co-Chairman Mel Amstutz had the kind of committee support which executives dream about; that is, chairmanned by capable men who handled the details of the meeting without fuss or fanfare. The ladies' committees under the co-chairmanship of Mrs. Danoff and Mrs. Boller did a masterful job.

The millionaires' party on Thursday night gave those who attended a little taste of Las Vegas. The party was an excellent demonstration of "easy come, easy go." Your Executive Secretary spent a million faster there than at the \$2.00 window at Arlington Park.

The ladies reported an outstanding trip to Haeger Pottery. From the looks of the number and quality of purchases, the pottery must like to have these ladies visit them.

Rob Roy did not disappoint those who attended. As he has done so many times in the past, he had a new trick, literally, too, and not figuratively.

Pictures of the meeting are sharp and definitive.

Those who know and have worked with George DeMent

(Continued on Page 4)

PICTURE CREDIT

Pictures of the 71st Annual Meeting are through the courtesy of Jon L. Anderson, Waukegan; The Waukegan News-Sun, Waukegan, and G. L. Walker, Joliet. Picture No. 2 is by Walker, pictures Nos. 8 and 9 are by the Waukegan News-Sun, and the remainder are by Jon L. Anderson. Prints of Mr. Anderson's pictures may be had for 75 cents each.

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THE CHALLENGE WE FACE

STAFF AND FACILITIES CRUCIAL NEEDS FOR RISING ENROLLMENTS

BY DEAN W. L. EVERITT*

A major challenge facing engineering education today is that of providing adequate staff and facilities to care for sharply increasing numbers of present and potential students. It has been generally realized that higher enrollments resulting from rising birth-rates would bring crises for higher educational institutions in the late 1960's unless foresight and financial support were brought to bear. Not so well recognized, however, has been the success of the publicity campaign conducted by industry, government, and the National Engineering Societies to make the American people aware of the needs and opportunities for technical college graduates. This has meant that key state-supported engineering colleges, of which Illinois seems to be well in the lead, are *now, in 1956*, faced with percentage increases in enrollment equal to those predicted for universities generally by 1966, with another doubling of engineering classes still ahead.

Thus engineering is already in a crucial situation. In

* W. L. Everitt, Dean, College of Engineering, University of Illinois. A Report to ISPE at its Highland Park meeting on April 13, 1956.

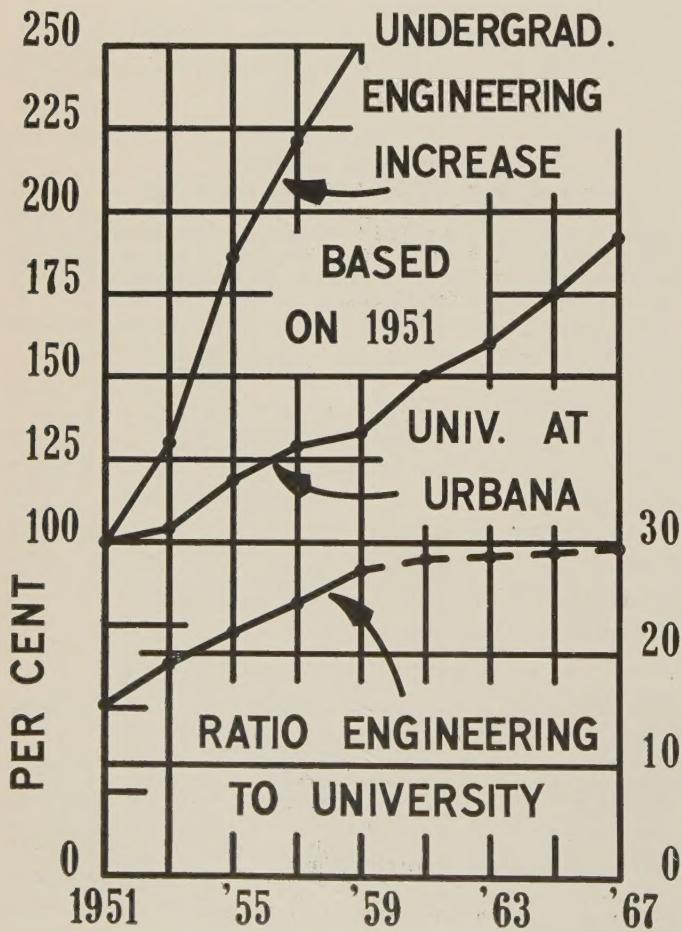


Figure 1

addition to focusing on the shortage of engineering and scientific graduates, we must now direct attention with equal vigor to the shortages of engineering teachers and physical facilities in engineering colleges. Where we have been concentrating our efforts on interesting more capable youngsters in engineering as a career, we must now exert ourselves strongly to help our engineering colleges accommodate the talented young people whose interest has been aroused, and who are trying to register for engineering classes which are already more than filled.

With your steady support and help, we at Illinois seem to have attracted good students at a somewhat more rapid rate than other colleges, and to be perhaps a year or two ahead of the national trend. Both our own studies and those reported in the current issue of the *Engineering and Scientific Manpower Newsletter* indicate that this will be a country-wide crisis almost before we can get set for it. Prompt and bold action is required to insure effective and high-quality education for our future engineering graduates. Recruiting engineering teachers to match our rising student numbers is an especially immediate and taxing problem. We must compete both with industry and defense to obtain the top-quality men we need, and this makes our task doubly difficult.

So far as we at Illinois are concerned, Figure 1 illustrates the dimensions of the problem for which Table 1

TABLE I
ENGINEERING AND UNIVERSITY ENROLLMENT ESTIMATES

Fall Term	Undergrad. Engineers	Total Engineers	Enrollment to 1951—Undergrad	Compared Per Cent Total	University Total at Urbana	Ratio of Engi- neering Total to University
1951	1822	2317	100	100	15,145	15.3
1952	2089	2554	115	110	15,464	16.4
1953	2370	2842	130	123	15,797	19.0
1954	2905	3383	160	146	16,866	20.1
1955	3360	3950	186	171	18,075	21.9
1956	3739	4405	205	191	19,150	23.0
1957	4044	4778	222	206	19,500	24.5
1959	4634	5555	254	240	20,200	27.5
1961	5455	6494	300	281	22,785	28.5
1963	5845	6984	320	302	24,250	28.8
1965	6571	7711	361	334	26,500	29.1
1967	7440	8585	408	371	29,100	29.5

supplies detailed data. The effect of national recognition of the demands for engineers has *doubled* our group of undergraduate engineering students since 1951, and promises to *double* that size *again* in another decade. Totals in engineering at Urbana were 1,822 students in 1951, 3,360 in the fall of 1955, and will be some 7,000 by 1966 if teachers and classrooms are available to accommodate them. The curve of engineering undergraduate enrollment (with graduate figures increasing similarly) against University totals is an interesting contrast, as are the relative increases shown in Figure 2. An even more significant indication of the spreading desire for engineering as a career is provided by the changing pro-

portion of University students at Urbana who enrolled in the College of Engineering, as Figure 1 presents them—up from 15 per cent in 1951 to 21½ per cent in 1955.

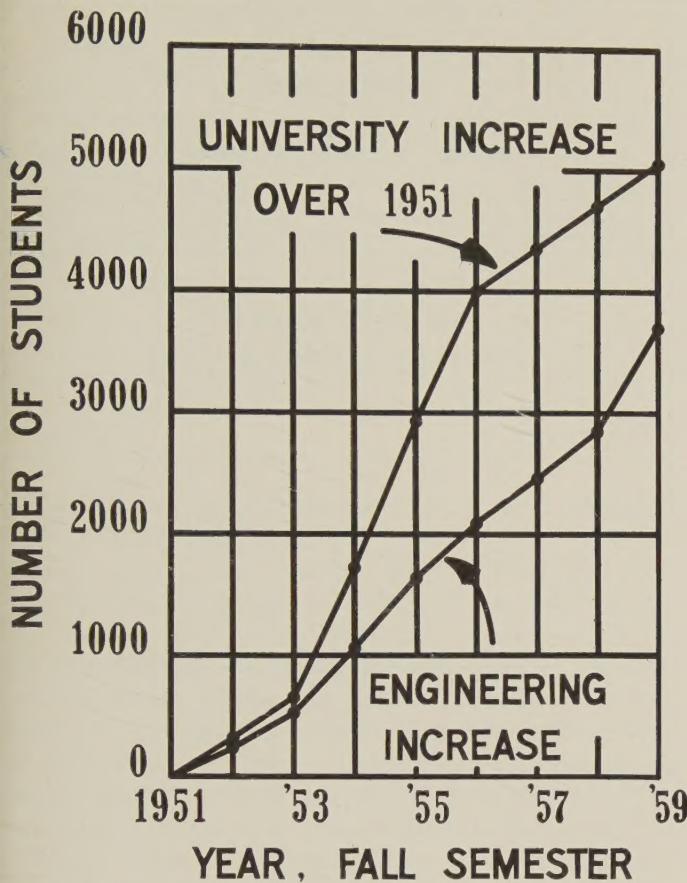


Figure 2

Though we have made and are making every effort to use teaching personnel most efficiently, and to bring our highly competent advanced students into teaching, our most critical and immediate shortage is instructors. If essential educational quality is to be maintained (and this, of course, is the continuing effort which we always consider our primary one—as evidenced by the *Evaluation Report on Engineering Education*), it is obvious that the quantity of well-trained teachers must increase proportionately with the number of students. Not only is the potential teacher group limited because of past low enrollments since the GI bulge, but we need as teachers precisely the men who are in greatest demand by industry and defense. At least until we can get additional help from industry, education is at the mercy of the competitive economic system.

Industrial salaries have risen most markedly among two major groups—young men with B.S., M.S., and Ph.D. degrees, and older, more experienced men with the potential to lead development teams in the newer areas of engineering progress such as aeronautics, electronics, fluid dynamics, and combustion. Salaries of new graduates have roughly quadrupled since our day of the 1940's; Ph.D.'s are today being offered salaries in the range from \$8,500 to \$12,000. These men are the ones

whom the engineering colleges must look to and somehow employ, as their equivalents already in teaching must be retained, if the inrush of students to engineering is to be cared for.

Faced with the predictions that we would have too few engineering graduates for national welfare if all those in the nation capable of absorbing engineering disciplines were educated by our colleges, we have no choice in our decision. It is inevitable, therefore, that under our free competitive system, the average cost per teacher must rise or there just will not be enough personnel available to do the job required. As this trend can only have a beneficial effect on the prestige and rewards, as well as on the national contribution of our profession generally, we hope that all ISPE and NSPE members will publicize our teaching manpower needs and help us meet them.

Figure 3 puts our teaching situation into perspective with our enrollment, and states quantitatively our needs for engineering teachers. This session our instructor-deficit is more than 60; our needs for additional staff will continue to increase from 144 in 1957 to 498 in 1967.

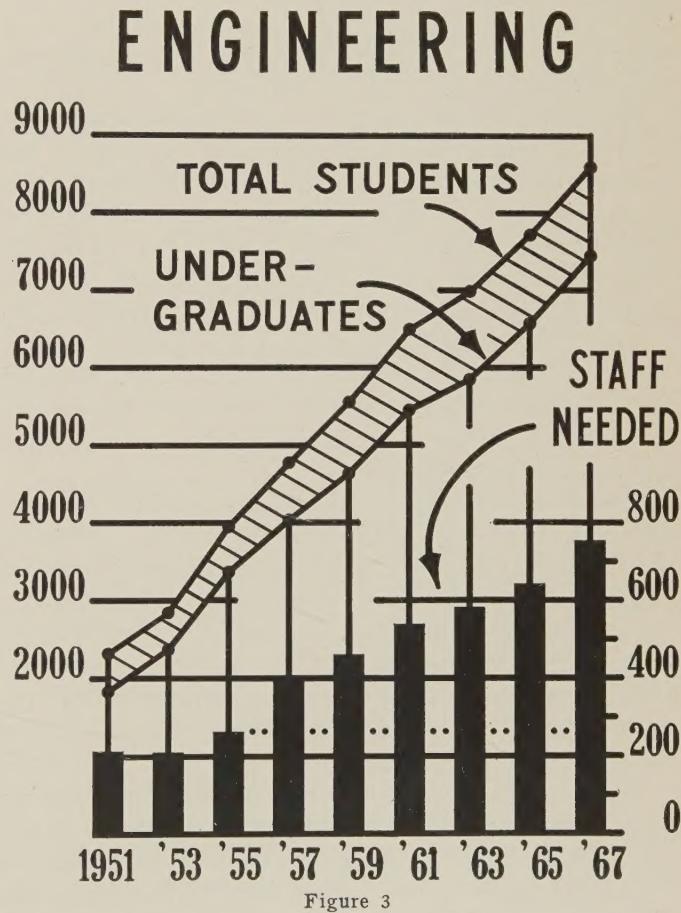


Figure 3

Perhaps I should point out that the same progression must hold in space needs also. We have placed our manpower difficulties in a primary position because teaching is primary, and because we have more chance of remedying teaching deficiencies as soon as appropriations are made available. Help from new buildings is several

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years away at best, considering the time required to build after plans have been drawn and money is in hand. We have been making careful studies, however, on a fifteen-year base, and have submitted staged proposals both for teacher and building additions.

The dramatic demonstration of our enrollment status is, finally, that we have *already passed* the *peak* of the *post-war GI load*. Furthermore, the rise we face now is not temporary, bearable over-load such as the GI two-year period represented. The increases promised for the next ten to twenty years are a steady *upgrade* with no foreseeable level-off or decline! This means that we cannot call upon our faculties patriotically to accept greater numbers of mature students for a limited time. We need instead to provide skilled and experienced leaders for America's youth in an age increasingly dependent upon science and technology.

What we in the engineering profession must do, then, is simply to advance our fire toward the next objective. Having successfully publicized and aroused *interest* in engineering, we now need to implement that interest by securing adequate staff, housing, and equipment to deal with our rising enrollments in engineering sciences. Staff members and teachers are particularly critical, for we need these most immediately, when the supply is least and industrial competition greatest.

Our plans are drawn, however, and we of engineering education feel confident that we can cope with the future successfully if you of the profession and our legislators will grant us the necessary backing. With this, we are sure that we can not only continue and advance a sound program in technical education, but that we can make a major contribution to the national welfare. If we are able to educate for productive professional work all the qualified students who are soundly motivated toward a life-work in engineering, the horizons for America cannot but lift!

VOX SECRETARIU—(continued from page 1)

during the past decade were delighted with the fine tribute he was given by Mayor Richard J. Daley. An accolade given as this one was given—publicly—by Mr. Daley, is especially nice. The mayor departed from his notes and was sincere and enthusiastic in his praise of George and his work.

Friday night marked another first in the long history of the Illinois Society. By necessity, the banquet was televised over a closed circuit to the overflow crowd in another room.

Refresher Course Class Round-Up

The Spring of 1956 was the first time in the history of the Society when refresher courses were sponsored in preparation for the professional, structural, and land surveyor examinations. Courses have been sponsored in all three groups at different times but this is the first time all three groups have met simultaneously. There were ten professional classes and one each structural and land surveyor class.

Dates to Remember

The National Society of Professional Engineers' 22nd Annual Meeting, Hotel Ambassador, Atlantic City, N. J., on May 24 to 26. The 20th Annual Meeting of the Missouri Society of Professional Engineers, Hotel President, Kansas City, Missouri, on June 1st and 2nd. The June Meeting of the Illinois Society Board of Direction on June 9th, University Y.M.C.A.

Miscellany

The Illini baseball team got off to a good start winning a single-game opener and a double-header from Purdue on Saturday, April 28 . . . Need much more help from Membership Committees if Illinois is going to make any kind of a showing in its contest with the Missouri Society. At this time, Illinois is running a not-too-good second

Illinois Society of Professional Engineers

Annual Report of Fees and Salaries Committee

NOTE: The revised basic minimum fees in this report have been approved by vote at the 71st Annual Business Meeting of the Illinois Society on April 13, 1956 and are therefore now in effect.

The revised salary schedule in this report has been approved by vote at the same time and place as the fee schedule.

It is suggested that you cut out the fee schedule and paste it over the fee schedule on page 2, also cut out the salary schedule and paste it over the salary schedule top page 15 in the Third Edition of the Minimum Fees and Salary Schedule.

You have charged this Committee with the preparation of a schedule of minimum fees and salaries to be recommended for the guidance of, but not mandatory for, those interested. It is understood that the recommendations must receive the approval of the Board of Direction and of the Society before becoming effective. This Committee has been further charged to prepare minutes or reports of all meetings in order to provide information for recommendations and to promote continuity of action. These minutes or reports, together with charts, tables and graphs, have been forwarded to your Executive Secretary following Committee meetings held November 19, 1955 and February 11, 1956.

Your Committee has studied fees and salary schedules prepared by the professional engineering societies in ten neighboring states, the Manual of Professional Practice for Civil Engineering No. 29, and the American Institute of Consulting Engineers' fee schedule adopted June 4, 1952. It has reviewed the Income and Salary Survey of 1954 by the National Society of Professional Engineers. It has considered the recommendations of past ISPE committees and those of the Special Committee on Fees and Salaries appointed at the 70th Annual Meeting. It has been noted that the professional engineering societies in certain neighboring states, the ASCE and AICE have adopted some of the recommendations which have been made by past ISPE fees and salaries committees.

This Committee recommends for immediate approval a fee schedule eliminating the step-back characteristics of the present schedule and recommending that fees be based on per diem or cost-plus-fixed fee charges for work on which the construction cost is less than \$20,000. The present schedule, which is lower than that in neighboring states, produces too many inadequate fees, particularly where construction cost is \$500,000 or less. Consulting engineers have reported to this Committee that:

A. Recommended *minimum* fees have a tendency to fix prevailing *maximum* charges for engineering services; and

B. Consultants cannot continue to perform first class services for the fees presently recommended and still pay the recommended salary schedule.

1. Recommendation for Immediate Action

Revise Section I of Recommended Schedule of Fees and Salaries for General Engineering Services, paragraph one, as follows:

Cost of Construction Less than \$20,000	Basic Minimum Fees (Per Cent) Per Diem or Cost-plus-fixed Fee
First \$ 20,000.....	10.00
Next \$ 30,000.....	8.25
Next \$ 50,000.....	7.00
Next \$200,000.....	5.75
Next \$200,000.....	5.25
Next \$500,000.....	4.75
All over \$1,000,000.....	4.50

The above schedule is intended to apply to general engineering projects of average complexity, such as water distribution and sewer systems, simple bridges or dams, airports, highways, irrigation works, conventional levees and flood works, electric power transmission and distribution systems (excluding substations), gas and steam transmission and distribution mains, and similar work.

Example:

A consultant offers to perform engineering services on a project estimated to cost \$100,000. The estimated fee would be:

10% of \$ 20,000.....	\$2,000
8 1/4 % of 30,000.....	2,475
7 % of 50,000.....	3,500
	\$100,000
	\$7,975

This produces a fee of 8.0 per cent compared with 6.5 or 7.0 per cent under the schedule now in effect.

If construction cost falls to \$80,000, the engineer receives, if the recommended schedule is written into the contract, the following fee:

10% of \$20,000.....	\$2,000
8 1/4 % of 30,000.....	2,475
7 % of 30,000.....	2,100
	\$80,000
	\$6,575

This produces a fee of 8.2 per cent.

Comparison of ISPE salary schedules with those of other states is difficult because the duties and requirements for the respective grades vary from state to state. Although the salaries will vary with economic conditions, standards of performance for engineers of any one grade should be uniform throughout the engineering profession. Two of our neighboring state societies have already adopted the NSPE classification which your Committee has studied and recommends.

2. Recommended for Immediate Action

That the duties and requirements to qualify under the various professional grades as recommended by ISPE be standardized with those of professional engineering societies of other states. To this end, we recommend that ISPE adopt the classification of duties and responsibilities which have been standardized by the National Society of Professional Engineers. This recommendation follows.

A comparison with schedules of other states indicates that the present ISPE salary schedule is about in line, except that there is an unbalance between grades. Changes recommended, which follow standardization of grade classifications (Recommendation 2 above), are for the purpose of correcting this deficiency.

3. Recommendation for Immediate Action

Revise the Schedule of Minimum Salaries for Professional Engineers in Illinois (Section 4, page 15 of Recommended Schedule of Minimum Fees and Salaries), as follows:

Grade 1.....	\$ 3,600
Grade 2.....	4,425
Grade 3.....	5,450
Grade 4.....	6,640
Grade 5.....	8,000
Grade 6.....	9,500
Grade 7.....	11,200
Grade 8.....	13,200

The above schedule is based upon the Consumer Price Index of the 1947-49 average. It can be brought to date by multiplying the respective salaries by the current U. S. Bureau of Labor Statistics' "All-items Index."

The above schedule should be brought to date and published in the ILLINOIS ENGINEER at least once a year with the following notation:

"The above figures have been arrived at by multiplying the recommended schedule of minimum salaries for professional engineers by the U. S. Bureau of Labor 'All-items Index' for(date)....."

Recommendations Requiring Further Study

1. That the Fees and Salaries Committee revise the booklet, Recommended Schedule of Minimum Fees and Salaries with a view towards improving its clarity and content and in the light of changes recommended hereinbefore. The revised publication should include:
 - A preface to the fee schedule in Section I which would set forth and describe the different bases for making charges for engineering services. This preface would suggest that the engineer discuss with this the different methods for establishing fees with a view towards agreeing on a fee basis which is both logical and equitable.

- A second schedule setting forth minimum recommended fees based on a percentage of cost of construction. This schedule would apply to engineering involving extensive design, research, or complicated details.
2. That further committees explore methods for disseminating information on fees and salaries to employers of professional engineers.

Suggestions for Placing in Effect This Committee's Recommendations

1. In view of the fact that there are a number of copies of the June 1954 Recommended Schedule of Minimum Fees and Salaries booklet on hand and in use, your Committee suggests that the first two of the aforesigned recommendations for immediate action be placed in effect by issuing the printed percentage fee schedule for insertion in the booklet (over paragraph one of page two), the salary schedule at the top of page 15, and the classification of engineering grades and duties over pages 16 and 17. These inserts could be printed with an adhesive on the back.
2. As an alternative to issuing the inserts, your Committee recommends that there be published an interim booklet, Recommended Schedule of Minimum Fees and Salaries (Tentative). No schedule of fees and salaries, except those approved by the Board of Direction and the Society, would be published without an annotation that such were "tentative."
3. If financing is an obstacle blocking publication of the revised fees and salaries schedule and/or the interim booklet, your Fees and Salaries Committee would assume the cost thereof.

Respectfully submitted,
 EARL H. BELING
 LINAS H. BROWN
 GORDON V. CARLSON
 L. K. CRAWFORD
 ALLEN DRACHMAN
 E. A. FALKENBERG
 A. W. NEUREUTHER
 ROBERT E. STANLEY
 VAIL H. MOORE, Chairman

ROCKFORD LADIES ACTIVE

The Women's Auxiliary of the Rockford Chapter is busy planning the following coming events:

A coffee hour for the members of the Engineers' Refresher Class and their wives to be given at the home of Mrs. Royce Johnson, April 24, 1956. A joint dinner-meeting for the husbands and wives to be held at the Wagon Wheel, May 22, 1956.

A picnic in June . . . and plans for September include a tour of the Micro Switch Plant at Freeport, Ill.

Our Auxiliary seems to grow in membership each month and plans for the Fall Season look very bright.

MRS. JOHN K. GRUBBS, Secretary

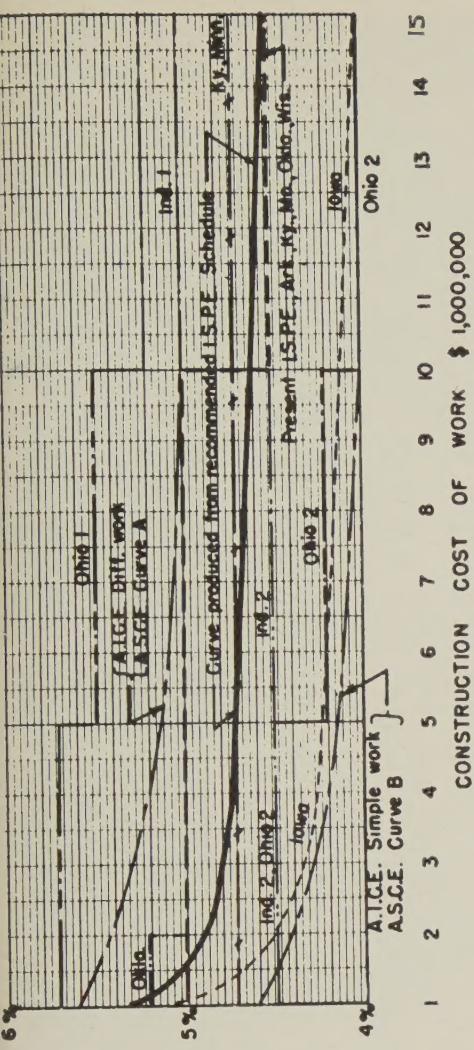
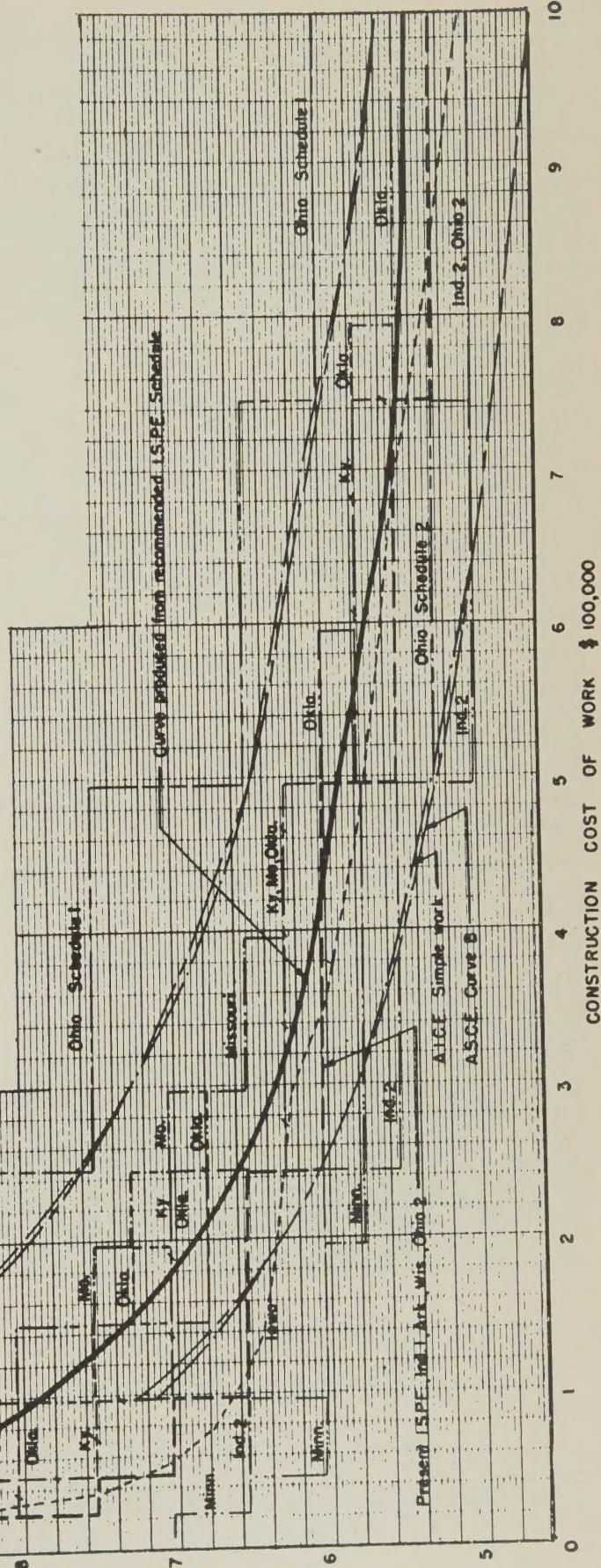
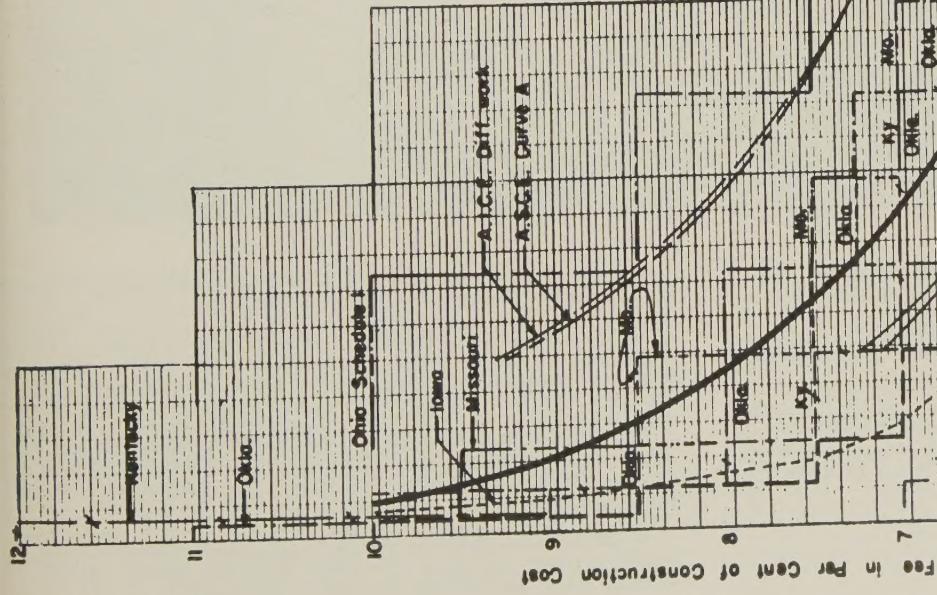
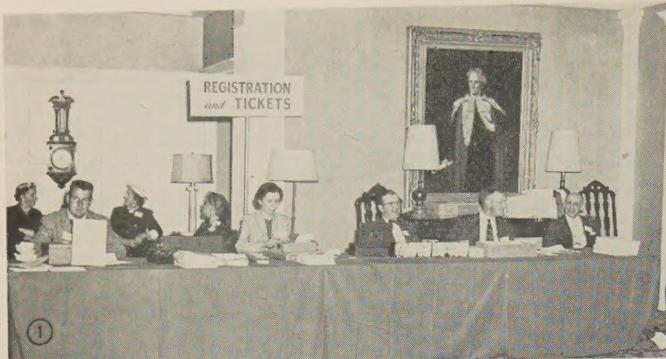
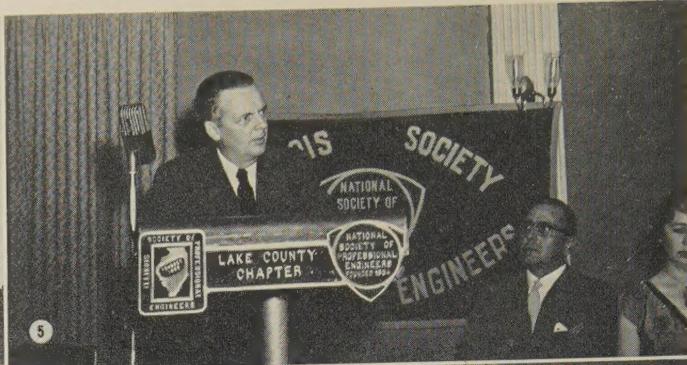


CHART SHOWING RELATIONSHIP BETWEEN RECOMMENDED
ILLINOIS SOCIETY OF PROFESSIONAL ENGINEERS PERCENTAGE FEE SCHEDULE
AND EXISTING PERCENTAGE FEE SCHEDULES OF I.S.P.E.
AND OTHER PROFESSIONAL ENGINEERING SOCIETIES





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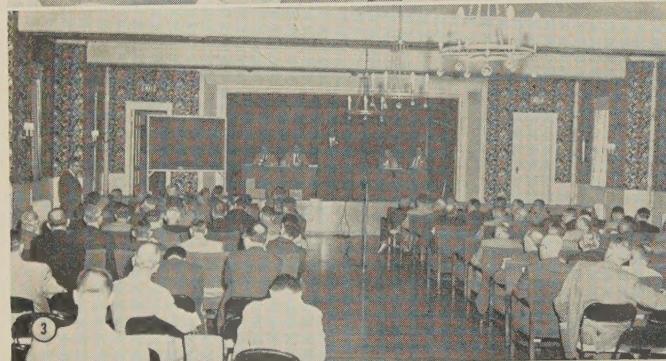
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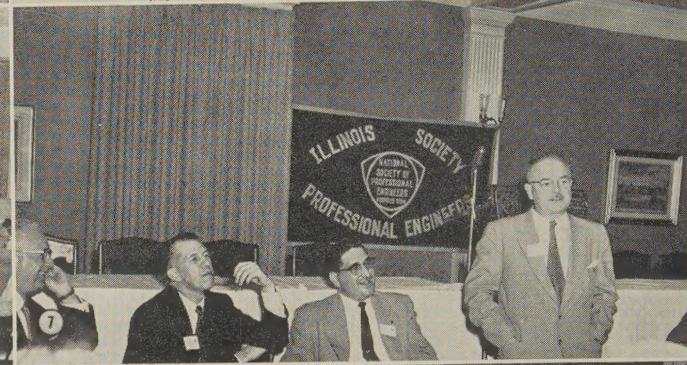
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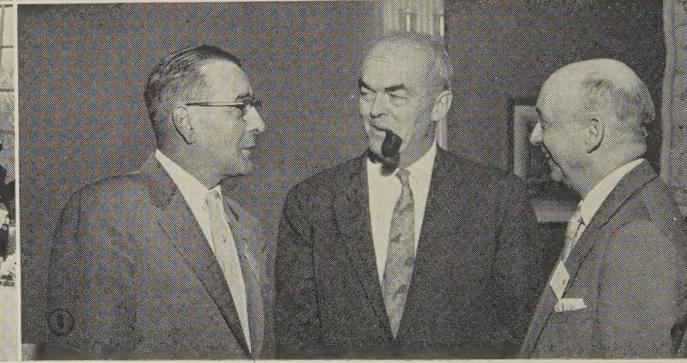
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1. Registration Desk, Hotel Moraine, Highland Park. From left to right, the men are Frank Furlan, Irwin Lietzke, Urban Neyer, and M. E. Amstutz.

2. The last meeting of the 71st Board of Direction Thursday, April 12th.

3. General view of the 71st Annual Business Meeting Friday afternoon.

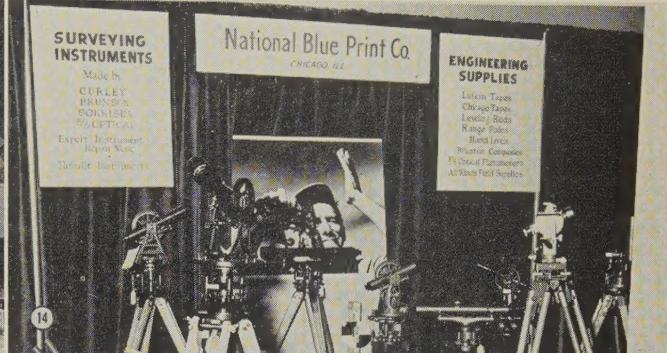
4. The Ladies' Style Show in the Terrace Room Friday.

5. Illinois Governor William G. Stratton addressing the Annual Banquet. President and Mrs. Wallace, right.

6. Chicago's Mayor Richard J. Daley speaks to the members and guests of the Society at dinner Thursday night. George L. DeMent, Chicago's Commissioner of Public Works and Illinois Society's National Director, introduced His Honor.

7. N.S.P.E. President A. C. Neff discussed National and Illinois Society problems at Friday luncheon. N.S.P.E. Executive Director and General Annual Meeting Chairman Sidney Danoff are amused.

8. President Dwain M. Wallace, left, and Co-chairman M. E. Amstutz, right, chat with Thursday's luncheon speaker, Austin L. Wyman, Chairman, Illinois Toll Road Commission.



9. Governor Stratton visits with President-elect Royce Johnson. The lovely lady is Mrs. Stratton. Looking on are Wm. T. Hooper, Jr. and President Dwain Wallace.

10. Dean and Mrs. William L. Everitt, University of Illinois, and National Director Wayne W. Wallace at the banquet.

11. St. Clair Chapter's large delegation at the Annual Banquet.

12. Engineers and their wives dance after the Annual Banquet.

13. Johnson Motors, one of the many fine exhibits at the Annual Meeting.

14. National Blue Print Company displayed a variety of surveying instruments.

15. Part of the group at the Friday luncheon.

16. "The Big Surprise." Whether because Lake County Chapter did an excellent piece of work with the Annual Meeting or whether it is all over, "The Look," by Lake County Chapter member R. L. Tippett is a fitting finale to the 71st Annual Meeting. We thank him for letting us borrow it.

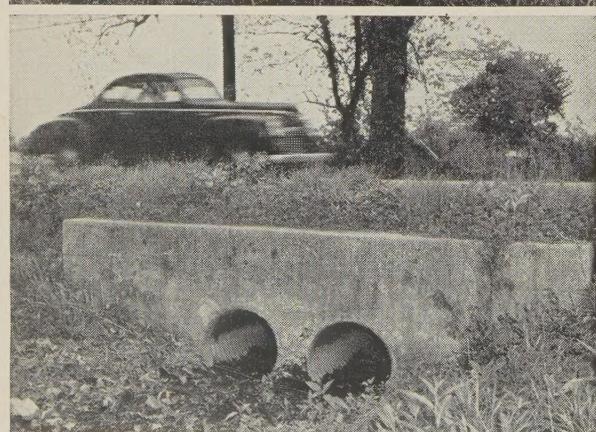
Obituaries

ROBERT T. FRENCH (N '55) elected on August 2, 1955. Electrical graduate, Purdue 1949. Member of Chicago Chapter and engineer with Johnson Electric Company, Chicago, Ill. Died in March, no details.

WALTER E. PUTMAN (S '10, N '39) died on April 1st. Was one of the three both State and National Life Members of the Illinois Society. Mr. Putman was an engineer with the East Side Levee and Sanitary District, East St. Louis, for more than 30 years. He is survived by his widow, two sisters, two daughters and a brother, William J., Urbana, who is also a State and National Life Member of the Illinois Society.

RALPH R. SHEWMAKER ('49). Born in Chanute, Kansas, 1902; B.S., Civil Engineering, Kansas State College, Manhattan, Kansas. He was a District Maintenance Engineer with the State of Illinois Division of Highways. Mr. Shewmaker died suddenly on February 19th. He was a member of Capital Chapter and various church and fraternal organizations.

GLEN A. SHAFFER ('55), Pana, Illinois, had been mining coal around Pana and Assumption for more than 25 years. He received his education at Armor Institute, Chicago. Mr. Shafer was born in Assumption, September 23, 1888, and was an active member of Capital Chapter; in fact, he attended the Chapter's March 27th meeting. He died in April; the date is unknown.



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72nd BOARD OF DIRECTION

(cover picture)

Highland Park, Illinois, April 13, 1956

First row, left to right: A. J. Feickert, St. Clair; P. E. Roberts, Executive Secretary; Dwain M. Wallace, Past President; Royce E. Johnson, President; A. W. Neureuther, Vice President; A. Douglas Spicer, Secretary-Treasurer; Wayne W. Wallace, National Director. Second row: Ben F. Muirheid, Champaign County; K. A. Brugger, Peoria; H. H. Cordes, Rock River; Arnold Lundgren, Rockford; L. S. Pappmeier, West Central; Wm. S. Gray, Joliet; C. R. Riseling, Egyptian; Frank W. Edwards, Chicago. Third row: Francis Weir, DuKane; J. D. Voorhees, Madison; H. S. Sommerscheid, Chicago; L. D. Hudson, Capital; A. C. Kessell, Capital; Sidney Danoff, Lake County; John Henline, Ambraw.

Teacher: "This essay about your dog is, word for word, the same as your brother's. How do you explain that?"

Superintendent's son: "Well, you see, sir, it's the same dog."

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COST OF LIVING INDEX

The cost of living correction factor to be applied to the I.S.P.E. Schedule of Minimum Fees and Salaries is based upon the Consumer Price Index of the 1947-49 average as determined by the Bureau of Labor Statistics. On the 1947-49 base the correction factor for March, 1956, is 114.7.

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Sr. Res. Engr., Mechanics Div., Ph.D. M.E. Age: 30-45. 10 yrs. exp. res. and dev. in terminal ballistics, aerodynamics, servo-mechanisms, theoretical mechanics, inertial guidance, aircraft structures or missiles. Know: Applied res. techniques. Duties: Mechanics Div. of planning superv. and tech. of engrs. on applied mechanical res. projects. Encourage to teach part time at grad. or under-grad. level and dev. ideas for sponsorship. Limited travel. For Res. Inst. Sal.: \$625-\$850. Loc.: Colorado. Will negotiate fee. C-4853

Sr. Res. Engr. Electronic Div. Ph.D. E.E. Age: 30-45. 10 yrs. exp. res. and dev. of complex electronic instrumentation, eqpt. or products. Know: Basic circuitry, electronic instrumentation or computers. Duties: Project leader in electronics div., planning, superv. and tech. of res. engrs. on variety of applied electronic res. projects. Encourage to teach part time at grad. or under-grad. level and develop project ideas for sponsorship. Limited travel. For Res. Inst. Sal.: \$625-\$850. Loc.: Colorado. Will neg. fee. C-4854

Res. Engr. Mechanics Div. M.S.-M.E. or Physics. Age: 25-40, 4 yrs. exp. res. and dev. in ballistic aerodynamics, servo-mech., theoretical mechanics, guidance, structures or missiles. Know: Applied res. techniques. Duties: Technically conducting res. and dev. on 1 or more phases of applied res. projects in mechanics. Encourage to teach part time and dev. project ideas for sponsorship. Limited travel. For Res. Inst. Sal.: \$500-\$750/mo. Loc.: Colorado. Employer will negotiate the fee. C-4855

Sr. Res. Physicist, Physics Div. Ph.D. in Physics. Age: 30-45. 10 yrs. exp. in res. and dev. in physics, as geophysics, radiation, electro-magnetic meteorology, acoustics, etc. Know: Applied res. techniques in physics. Duties: In physics div. for planning, superv. and tech. res. Engrs. conducting applied physics res. projects. Encourage to teach part time at grad. or under-grad. level and to dev. ideas for sponsorship. Limited travel. For Res. Inst. Sal.: \$625-\$850/mo. Loc.: Colorado. Employer will negotiate the fee. C-4856

Mgr. Ind. Engr. M.E. or I.E. 5 plus yrs. exp. superv. industrial engr. in sheet metal fabr. shop. Duties: Supv. ind. engrg. dept. handling review of product design, mfg. methods, tooling, eqpt. and machy., utilization, consulting, plant layout, cost reduction, project tryouts. For Mfr. of Air-Cond. Sal.: \$12,000-\$17,000. Location: Wisconsin. C-4907

Appl. Engr. Degree. Age: to 35. Know: refr., chemistry, welding or foundry operations. Duties: Assist salesmen and customers on solving tech. problems with respect to appl. of carbon dioxide. Some travel. For Mfr. of Ind. Gas. Sal.: \$6000-\$72000. Loc.: Ohio and Pa. Employer will pay the fee. C-4911

Dev. and Des. Engrs. M.E. pref. Duties: Design and dev. of domestic automatic clothes washing machines and dryers, which include improvement of present design, future dev., production problems and cost reduction. For Mfrer. Sal.: \$6000-\$10,000. Loc.: Chicago. Employer will pay the fee. C-4915

Dev. Htg. Units. E.E. Know: Chemistry or metallurgy. Duties: Res. and dev. of electric heating elements used in domestic household appliances. For Mfr. Sal.: \$6000-\$8000, dep. on exp. Loc.: Chicago. Employer will pay the fee. C-4916

Works Engr. Age: to 50. 5 plus yrs. exp. in superv. gen'l. engrg. in hvy. industry. Know: Designing, tools and dies. Duties: Charge of maint., engrg., tooling, costs estimating on steel fabr. work on hvy. sheet metal. Good deal of heavy press work. For Mfr. of roof and deck steel. Sal.: \$14,000-\$15,000. Loc.: Western Chgo. suburb. Employer will negotiate the fee. C-4927

Res. Director Malt. M.S. or better in Chem. Age: to 45. 5 plus yrs. exp. superv. research in foods, biologicals, pharmaceuticals or similar fields. Know: Basic res. Duties: Directing and recommend programs in research in malt products. Will superv. lab. and

pilot plants. For Mfr. of Malt. Sal.: to \$15,000. Loc.: Wisconsin. Employer will pay the fee. C-4931

Analytical Chemistry. Ph.D.-Chem. Age: to 40. Duties: Doing research work on methods analysis in food industry in organic products. For Mfr. of malt products. Sal.: to \$10,000. Loc.: Wisconsin. Employer will pay the fee. C-4933

Ch. Prod. Engr. M.E. degree or equiv. Age: 30-45. Min. 10 yrs. exp., 5 yrs. in design or testing, 5 yrs. production engr. Know: Internal combustion eng. Duties: Liaison between mfg. and eng. estab. new dept. Handle product modification and improvement after release for production. Occasional travel. No car req'd. For Mfr. of internal comb. engr. Sal.: \$7700-\$11,500. Loc.: Wisconsin. Employer will pay the fee. C-4950

Ch. Install. Engr. Eng. Grad. Age: 35-45. 8 yrs. exp. 5 yrs. installation engr. internal combustion engr. Know: Lubr., cooling, fuel, exhaust control. systems. Duties: Liaison with customers pert. to prod. 1. inst. 2. analyze incoming spec. from sales for items pert. to installation of prime prod. incl. all access. and systems. 3. Develop. of accessories and modification of systems. Occasional traveling. No car req'd. For Mfr. of internal comb. engrg. Sal.: \$7700-\$11,500. Loc.: Wisconsin. Employer will pay the fee. C-4951

Ch. Dev. Engr. Master's degree. Age: 35-45. 5-10 yrs. exp., at least 3 yrs. dev. work on components of engines. 3 yrs. directing Tech. Engr. Know: Int. comb. engrg. Duties: Resp. for dev. of all components of product line and theoretical stress analysis and torsional or linear vibratic analysis systems. Consultant to project engrs. and designers in selection of appropriate design. Occasional travel. For Mfr. of Int. Comb. Engr. Sal.: \$7700-\$11,500. Loc.: Wisconsin. Employer will pay the fee. C-4952

Tech. Editor. E.E. Electronics. Exp. in writing military specs. for handbooks and other publications. Know: Graphic arts helpful. Duties: Writing, editing and publ. military handbooks and other publications. May direct an assistant. Some travel. For tech. publ. of handbooks. Sal.: to \$750 plus profit sharing. Loc.: Chicago. Employer will pay the fee. C-4953

Instrument and Rodman. 2 plus yrs. exp. in bldg. surveying. Duties: Working under superv. of Ch. of party doing surveying on multi-story apt. bldg. For contractor. Sal.: Abt. \$110/wk. Loc. Chicago. C-4954